

MassDEP GHG Reporting Program Summary Report For Retail Sellers of Electricity Emissions Year 2023 February 2026

Contents

Introduction	1
Step 1: Unit-Specific Generation Reported by Retail Sellers	2
Step 2: Initial GHG Emission Factors	6
Step 3: Final GHG Emission Factors	7
Step 4: GHG Emissions Reported by Retail Sellers.....	8
Appendix 1: 2023 Individual Retail Seller GHG Emissions	12
App 1 GHG Emissions Tables.....	12
Appendix 2A: Optional Unit-Specific Generation Reported by MEDs for 2023	13
App 2A MED Unit Specific Tables.....	13
Appendix 2B: Unit-Specific Generation from GIS Certificates Reported by Electric Utilities and Competitive Suppliers for 2023	18
App 2B EU-CS Unit-Specific Tables.....	18
Appendix 3: 2023 Retail Level Emission Factors for Use by Consumers of Electricity to Report Greenhouse Gas Emissions (Massachusetts-based Emission Factors)	19

Introduction

The information below summarizes the 2023 greenhouse gas (GHG) emissions and megawatt hours (MWh) of electricity sales in Massachusetts by the 102 retail sellers that sold electricity in Massachusetts during that year. Retail sellers of electricity in Massachusetts are required to report this information to the Massachusetts Department of Environmental Protection (MassDEP) under regulation 310 CMR 7.75.¹ MassDEP uses this information in considering measures to reduce emissions from the electric sector. This was the fifteenth² year of emissions reporting by retail sellers of electricity, and the sixth year of reporting under regulation 310 CMR 7.75. Data and comparisons from the first nine reporting years under 310 CMR 7.71 are provided in the summary reports for 2008 and 2010-2017.³ Changes to the regulation and the methodology for calculating emission

¹ Additional information about MassDEP’s GHG reporting program is available at [MassDEP Greenhouse Gas Emissions Reporting Program | Mass.gov](https://www.mass.gov/info-details/massdep-greenhouse-gas-emissions-reporting-program); see particularly *Retail Seller of Electricity Reporting*.

² 2017 was the final reporting year under 310 CMR 7.71. Beginning with 2018 calendar year emissions, retail sellers began reporting under 310 CMR 7.75(9).

³ The summary reports may be found at [Massachusetts Greenhouse Gas Reporting Program Data](https://www.mass.gov/info-details/massachusetts-greenhouse-gas-reporting-program-data).

factors make data from before 2018 not comparable with data since 2018; therefore, this summary only includes data beginning with 2018.

MassDEP requires retail sellers to report emissions that occur from the generation of the electricity that they sell. The GHGs emitted from power plants during combustion of fuels to generate electricity are carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O). Biogenic and non-biogenic GHG emissions are reported separately. Biogenic GHG emissions are emissions of CO₂ that result from the combustion of biogenic (plant or animal) material, excluding fossil fuels. Non-biogenic GHG emissions include CO₂ released from the combustion of non-biogenic fuel, plus CH₄ and N₂O released from the combustion of any fuel.

The retail seller reporting process consists of 4 steps:

- Step 1. Unit-Specific Generation: Retail sellers report the use of MWh from unit-specific generation and any associated emissions.
- Step 2. Initial GHG Emission Factors: MassDEP develops initial GHG emission factors in terms of pounds of non-biogenic and biogenic GHGs in carbon dioxide equivalents per megawatt hour (lb CO₂e/MWh) based on all the electricity consumed in Massachusetts.
- Step 3. Final GHG Emission Factors: MassDEP develops final GHG emission factors for the electricity consumed in Massachusetts that was not reported in Step 1, by removing the MWh and emissions reported in Step 1 from the initial emission factors developed in Step 2.
- Step 4. GHG Emissions: Retail sellers report their GHG emissions by multiplying the final emission factors in Step 3 by their electricity sold and not reported in Step 1, and then adding emissions reported in Step 1.

This summary document reports data as calculated and/or corrected by MassDEP, and not necessarily as reported by retail sellers (as discussed further below).

Step 1: Unit-Specific Generation Reported by Retail Sellers

The purpose of reporting unit-specific generation is to assign to each retail seller the MWh and associated emissions from the unit-specific electricity claimed by each through ownership of the unit, contract for the power, or the purchase of certificates. Under 310 CMR 7.75, this report is mandatory for electric utilities and competitive suppliers and optional for municipal electric departments and light boards (MEDs).⁴ Table 1 shows the number of retail sellers reporting MWh from specific generating units from 2018 through 2023.

⁴ In this document, Municipal Electric Departments and Municipal Light Boards are collectively referred to as municipal electric departments (MEDs).

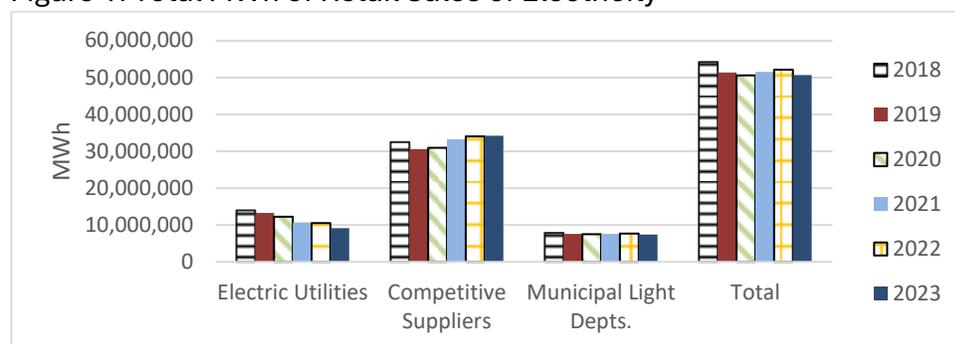
Table 1. Number of Retail Sellers Reporting MWh from Unit-Specific Generation

Year	Electric Utilities	Competitive Suppliers	Municipal Electric Departments	Total Retail Sellers
2018	all 3	62 of 65	all 40	105 of 108
2019	all 3	56 of 61	all 40	99 of 104
2020	all 3	60 of 61	all 40	103 of 104
2021	all 3	56 of 59	all 40	99 of 102
2022	all 3	57 of 61	all 40	100 of 104
2023	all 3	57 of 59 ⁵	all 40	100 of 102

MWh and emissions from specific electricity generating units retired by electric utilities and competitive suppliers are reported through their annual ‘Renewable Portfolio Standard/Alternative Portfolio Standard/Clean Energy Standard (RPS/APS/CES) Workbook’ to the Massachusetts Department of Energy Resources (DOER).^{6,7} Retail sellers are then required to include these MWh and emissions in the mandatory GHG Emissions report. The reporting of MWh from specific electricity generating units by MEDs is through the submittal of an optional unit-specific generation report to MassDEP.

Figures 1 through 3 show the total retail sales and unit-specific generation by retail seller type for 2018 through 2023. The tables below each figure list the corresponding values. The increase in unit-specific generation in 2023 for electric utilities and competitive suppliers is due to the first year of compliance with MassDEP’s CES-E (clean existing generation) requirement.

Figure 1. Total MWh of Retail Sales of Electricity



⁵ Fifty-nine competitive suppliers sold retail electricity in Massachusetts in 2023. Two competitive suppliers (Astral and Mega) failed to report their 2023 unit-specific generation. It is MassDEP’s understanding that these competitive suppliers no longer operate in MA.

⁶ Certificates are required for compliance with DOER’s [Renewable Energy Portfolio Standard \(RPS\)](#) and [Alternative Energy Portfolio Standard \(APS\)](#) [Alternative Energy Portfolio Standard \(APS\)](#) programs, and MassDEP’s [Clean Energy Standard \(CES\)](#) program.

⁷ Additional details on Step 1 of the GHG reporting process in Massachusetts can be found at [AQ 31, 32: Retail Seller of Electricity Greenhouse Gas Emissions Reporting](#).

Figure 1 Table: Total MWh of Retail Sales of Electricity

Year	Electric Utilities	Competitive Suppliers	Municipal Light Departments	Total
2018	13,950,988	32,451,972	7,802,857	54,205,817
2019	13,228,546	30,610,696	7,546,939	51,386,181
2020	12,237,524	30,911,652	7,460,823	50,609,999
2021	10,633,149	33,292,115	7,571,642	51,496,906
2022	10,506,904	34,000,689	7,634,751	52,142,344
2023	9,089,495	34,195,179	7,413,550	50,698,224

Figure 2. MWh reported from Unit-Specific Generation

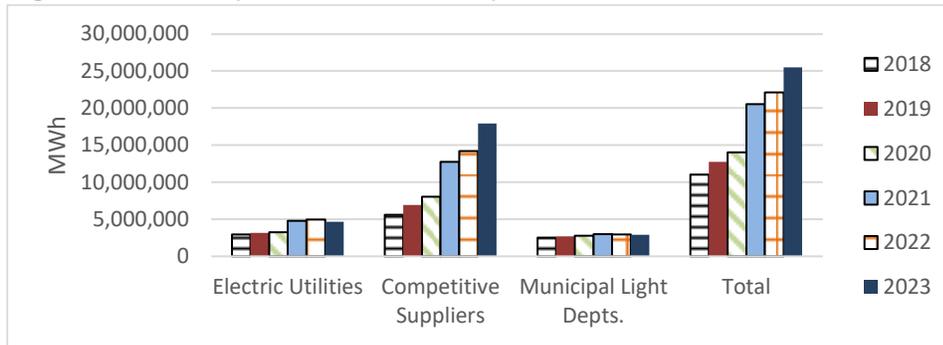


Figure 2 Table: MWh reported from Unit-Specific Generation

Year	Electric Utilities	Competitive Suppliers	Municipal Light Departments	Total
2018	2,931,319	5,606,792	2,511,304	11,049,415
2019	3,138,707	6,911,453	2,674,459	12,724,619
2020	3,232,401	8,028,239	2,750,325	14,010,965
2021	4,791,847	12,739,762	3,001,576	20,533,185
2022	4,939,277	14,208,388	2,950,288	22,097,953
2023	4,651,630	17,960,265	2,915,114	25,527,009

Figure 3. MWh from Unit-Specific Generation as % of Total Retail Sales

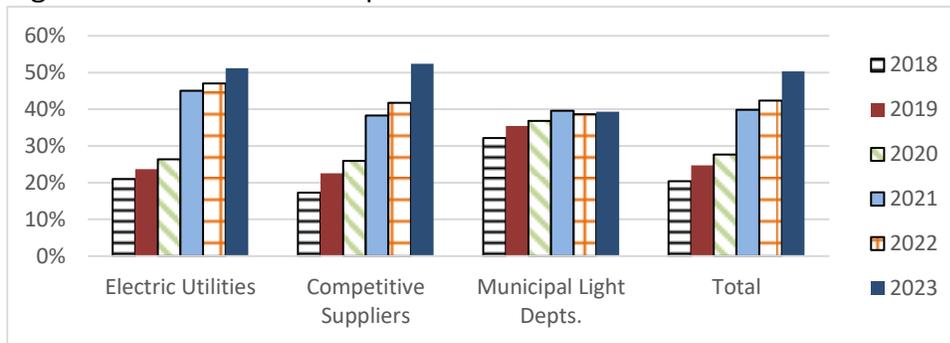


Figure 3 Table: MWh from Unit-Specific Generation as % of Total Retail Sales

Year	Electric Utilities	Competitive Suppliers	Municipal Light Departments	Total
2018	21%	17%	32%	20%
2019	24%	23%	35%	25%
2020	26%	26%	37%	28%
2021	45%	38%	40%	40%
2022	47%	42%	39%	42%
2023	51%	53%	39%	50%

Figures 4 and 5 show the amount of emitting and non-emitting unit-specific generation retired by retail seller type for 2023 in MWh and as a percent of the total reported unit-specific generation. The tables below each figure list the corresponding values.

Figure 4. MWh of Unit-Specific Non-emitting and Emitting Generation Reported for 2023

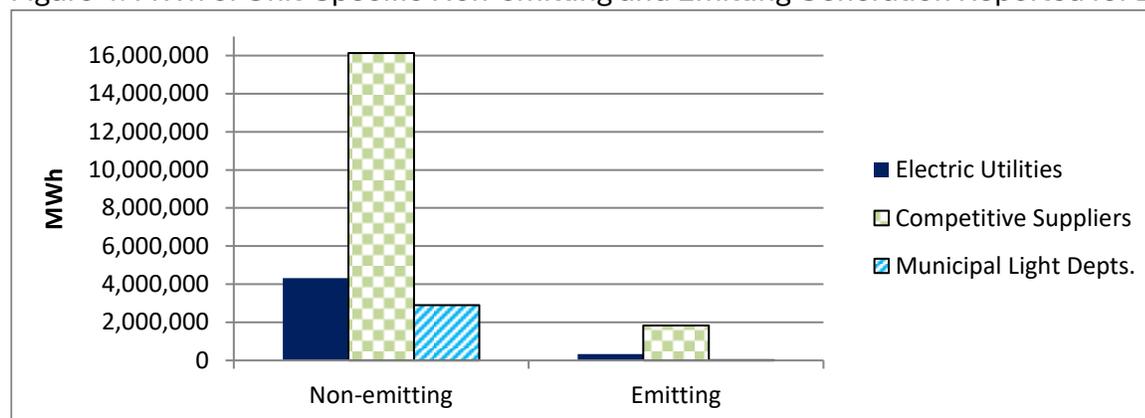


Figure 4 Table: Unit-Specific Non-emitting and Emitting Generation (as MWh) Reported for 2023

Retail Seller Type	Non-Emitting MWh	Emitting MWh	Total Unit-Specific MWh by Retail Seller Type
Electric Utilities	4,317,563	334,067	4,651,630
Competitive Suppliers	16,134,379	1,825,886	17,960,265
Municipal Light Depts.	2,904,483	10,631	2,915,114
Total MWh by Generation Type	23,356,425	2,170,584	25,527,009

Figure 5. Unit-Specific Non-emitting and Emitting Generation (as Percent of Unit-Specific Generation) Reported for 2023

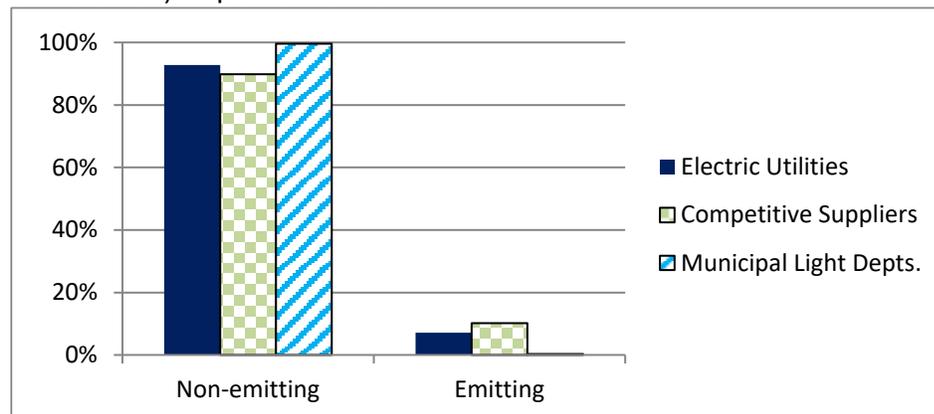


Figure 5 Table: Unit-Specific Non-emitting and Emitting Generation (as Percent of Unit-Specific Generation) Reported for 2023

Retail Seller Type	Non-Emitting	Emitting
Electric Utilities	92.8%	7.2%
Competitive Suppliers	89.8%	10.2%
Municipal Light Departments	99.6%	0.4%

Details on the MWh reported by retail sellers from specific generating units can be found in Appendix 2A: *Optional Unit-Specific Generation Reported by MEDs for 2023* and Appendix 2B: *Unit-Specific Generation from GIS Certificates⁸ Reported by Electric Utilities and Competitive Suppliers for 2023*.

Step 2: Initial GHG Emission Factors

Tables 2a. and 2b. show the initial (Step 2) emission factors. The combined non-biogenic and biogenic emission factors have been included in this summary report for informational purposes. (Please note that Tables 2a, 2b, 3a and 3b present wholesale emission factors. Consumers of electricity that want to use Massachusetts-specific emission factors to report their GHG emissions from electricity use should see Appendix 3: *2022 Retail Level Emission Factors for Use by Consumers of Electricity to Report Greenhouse Gas Emissions (Massachusetts-based Emission Factors)* for appropriate values.)

For an explanation of the methodology used to calculate the initial emission factors, and of the “Massachusetts-based” and “Regional” approaches used to calculate the emission factors in Tables 2a. and 2b., see *Draft 2023 Greenhouse Gas (GHG) Emission Factors to*

⁸ Certificates are created and retired through the New England Power Pool Generation Information System (NEPOOL GIS). NEPOOL GIS “issues and tracks certificates for all MWh of generation and load produced in the ISO New England control area, as well as imported MWh from adjacent control areas.” One certificate is generated for each MWh. More information at [NEPOOL GIS](https://www.nePOOL.com/gis/).

be used by Retail Sellers of Electricity Reporting under 310 CMR 7.75(9)(c) “Greenhouse Gas Emissions Reporting.”⁹

Table 2a. Initial Massachusetts-based Approach GHG Emission Factors for Electricity Consumed in Massachusetts, prior to accounting for Unit-Specific Generation (lb CO₂e/MWh)

Year	Non-Biogenic	Biogenic	Combined
2018	445	72	517
2019	416	62	478
2020	509	68	577
2021	466	71	537
2022	454	55	509
2023	431	62	493

Table 2b. Initial Regional Approach GHG Emission Factors for Electricity Consumed in Massachusetts, prior to accounting for Unit-Specific Generation (lb CO₂e/MWh)

Year	Non-Biogenic	Biogenic	Combined
2018	430	134	564
2019	402	119	521
2020	407	108	515
2021	426	126	552
2022	439	99	538
2023	441	96	537

Step 3: Final GHG Emission Factors

Tables 3a. and 3b. present the final (Step 3) emission factors upon which retail seller GHG emissions are based. The combined non-biogenic and biogenic emission factors have been included in this summary report for informational purposes.

The RPS regulation requires electric utilities and competitive suppliers to retire certificates from emitting unit-specific generation, including municipal solid waste (MSW).¹⁰ Therefore, electric utilities and competitive suppliers are required to claim these certificates in their unit-specific generation reports. Because MSW emissions make up the major portion of biogenic emissions, particularly in Massachusetts, the result is a decrease from the initial biogenic emission factors (Tables 2a. and 2b.) to the final biogenic emission factors (Tables 3a. and 3b.) that are applied to non-unit-specific generation.

⁹ [Draft 2023 Greenhouse Gas Emission Factors to be used by Retail Sellers of Electricity Reporting under 310 CMR 7.75\(9\)\(c\)](#)

¹⁰ Massachusetts retail sellers retired approximately 95% of the MWh generated in Massachusetts by MSW in 2023.

Table 3a. Final Massachusetts-based Approach GHG Emission Factors for Electricity Consumed in Massachusetts, after accounting for Unit-Specific Generation (lb CO₂e/MWh)

Year	Non-Biogenic	Biogenic	Combined
2018	486	18	504
2019	468	8	476
2020	605	2	607
2021	634	15	650
2022	637	0	637
2023	677	0	677

Table 3b. Final Regional Approach GHG Emission Factors for Electricity Consumed in Massachusetts, after accounting for Unit-Specific Generation (lb CO₂e/MWh)

Year	Non-Biogenic	Biogenic	Combined
2018	445	118	563
2019	421	104	525
2020	431	87	518
2021	478	117	595
2022	499	85	584
2023	523	82	605

Step 4: GHG Emissions Reported by Retail Sellers

Most of the 102 retail sellers submitted their GHG emissions reports as shown in Table 4. This summary report reflects the MWh and GHG emissions data for all retail sellers that submitted their emission reports and includes data for the two competitive suppliers that failed to submit the unit-specific generation report or the GHG emissions report.

Table 4. Number of Retail Sellers Reporting GHG Emissions

Year	Electric Utilities	Competitive Suppliers	Municipal Electric Departments	Total Retail Sellers
2018	all 3	58 of 65	all 40	101 of 108
2019	all 3	56 of 61	all 40	99 of 104
2020	all 3	58 of 61	all 40	101 of 104
2021	all 3	54 of 59	all 40	97 of 102
2022	all 3	55 of 61	all 40	98 of 104
2023	all 3	57 of 59 ¹¹	all 40	100 of 102

Figures 6a. through 6d. present the total GHG emissions for the three types of retail sellers in 2023 as Massachusetts-based non-biogenic and biogenic GHG emissions and Regional

¹¹ Two competitive suppliers (Astral and Mega) failed to report their 2023 GHG emissions. It is MassDEP's understanding that these competitive suppliers no longer operate in MA.

non-biogenic and biogenic GHG emissions, respectively. The tables below each figure list the corresponding values.

Figure 6a. Non-Biogenic GHG Emissions Reported by Retail Seller Type and Year using the Massachusetts-based approach (Short Tons CO₂e)

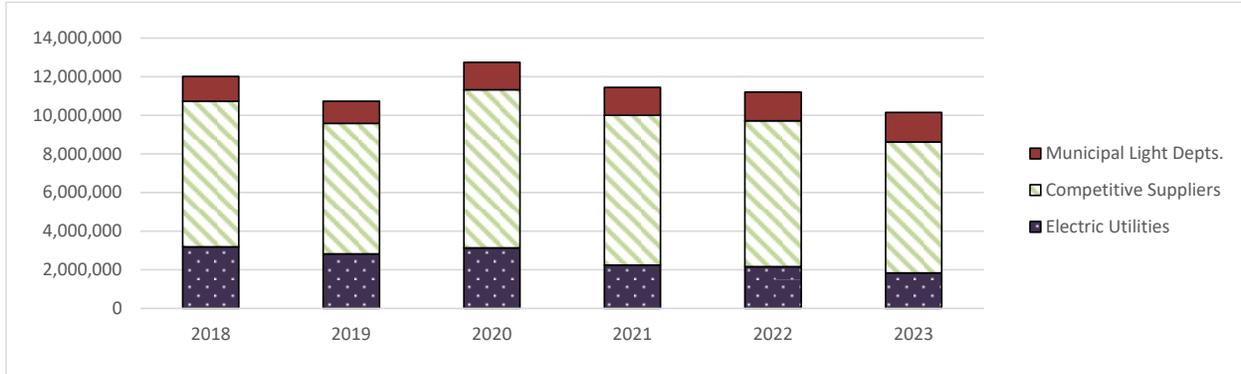


Figure 6a Table. Non-biogenic GHG Emissions Reported by Retail Seller Type and Year using the Massachusetts-based approach (Short Tons CO₂e)

Year	Electric Utilities	Competitive Suppliers	Municipal Light Departments	Total
2018	3,183,196	7,548,168	1,285,864	12,017,228
2019	2,818,274	6,768,544	1,140,160	10,726,978
2020	3,140,224	8,179,280	1,424,945	12,744,449
2021	2,247,553	7,752,319	1,449,539	11,449,411
2022	2,157,741	7,556,832	1,492,009	11,206,583
2023	1,832,641	6,785,412	1,522,757	10,140,810

Figure 6b. GHG Biogenic Emissions Reported by Retail Seller Type and Year using the Massachusetts-based approach (Short Tons CO₂e)

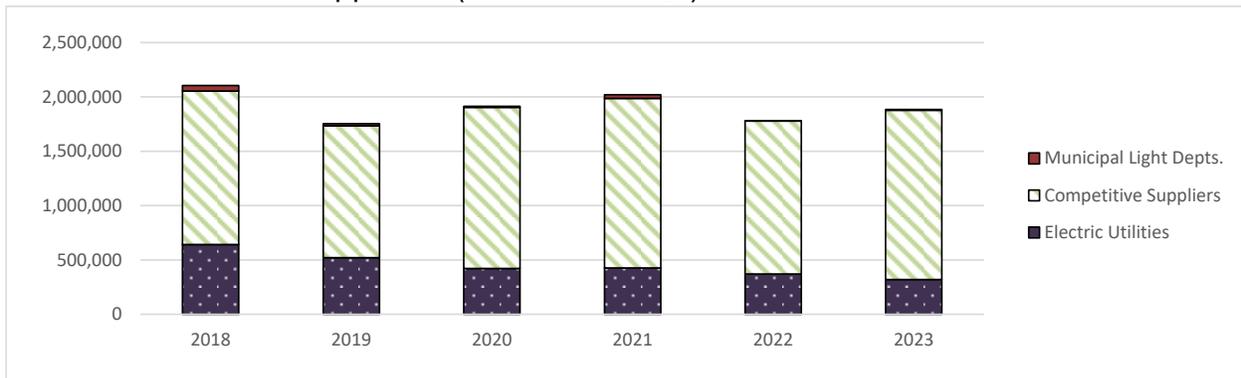


Figure 6b Table. Biogenic GHG Emissions Reported by Retail Seller Type and Year using the Massachusetts-based approach (Short Tons CO₂e)

Year	Electric Utilities	Competitive Suppliers	Municipal Light Departments	Total
2018	642,062	1,411,352	50,928	2,104,342
2019	520,238	1,213,013	19,490	1,752,741
2020	421,645	1,482,424	8,410	1,912,479
2021	425,224	1,559,685	35,258	2,020,167
2022	371,765	1,406,484	1,617	1,779,866
2023	319,519	1,558,058	7,072	1,884,649

Figure 6c. GHG Non-Biogenic Emissions Reported by Retail Seller Type and Year using the Regional Approach (Short Tons CO₂e)

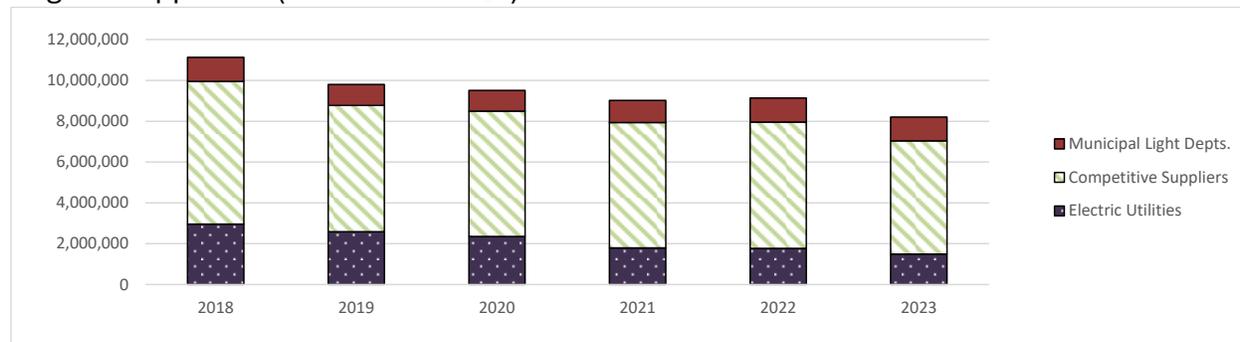


Figure 6c Table. Non-biogenic GHG Emissions Reported by Retail Seller Type and Year using the Regional Approach (Short Tons CO₂e)

Year	Electric Utilities	Competitive Suppliers	Municipal Light Departments	Total
2018	2,957,292	6,997,482	1,177,388	11,132,522
2019	2,581,163	6,191,248	1,025,657	9,798,068
2020	2,356,779	6,142,781	1,015,131	9,514,691
2021	1,789,729	6,141,486	1,091,351	9,022,566
2022	1,773,575	6,191,164	1,168,782	9,133,520
2023	1,490,976	5,535,324	1,176,377	8,202,627

Figure 6d. GHG Biogenic Emissions Reported by Retail Seller Type and Year using the Regional Approach (Short Tons CO₂e)

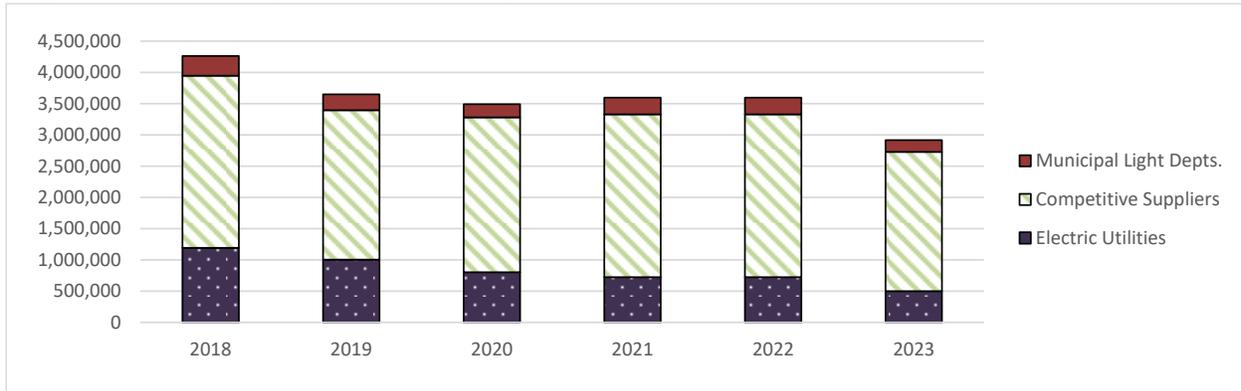


Figure 6d Table. Biogenic GHG Emissions Reported by Retail Seller Type and Year using the Regional Approach (Short Tons CO₂e)

Year	Electric Utilities	Competitive Suppliers	Municipal Light Departments	Total
2018	1,193,045	2,753,611	315,506	4,262,162
2019	1,004,550	2,392,169	253,369	3,650,089
2020	804,363	2,477,265	208,607	3,490,235
2021	722,600	2,605,989	267,916	3,596,505
2022	608,389	2,247,656	200,707	3,056,752
2023	501,471	2,223,689	191,508	2,916,669

The information provided in Figures 3, 5 and 6 should not be used to draw comparisons between the three types of retail sellers. Electric utilities and competitive suppliers are subject to two requirements that MEDs are not subject to: first, they must report all unit-specific electricity generation and, second, they must retire MSW certificates. These requirements can cause electric utilities and competitive suppliers to have higher relative emissions than MEDs.

The GHG emissions for each individual retail seller, and the total GHG emissions for each of the three types of retail seller, can be found in Appendix 1: *2023 Individual Retail Seller GHG Emissions*.

Appendix 1: 2023 Individual Retail Seller GHG Emissions

The 2023 GHG emissions for each retail seller are provided in three tables on the “App 1 GHG Emissions” tab of the accompanying 2023 RS Summary Appendices spreadsheet. The list of tables is provided below.

GHG emissions are calculated by MassDEP based on:

- the final GHG emission factors;
- MWh reported as retail load to MassDEP for compliance with the Clean Energy Standard by electric utilities and competitive suppliers and to the Department of Public Utilities (DPU) by MEDs, less MWh reported from unit-specific generation; and
- GHG emissions reported from unit-specific generation, as adjusted by MassDEP.¹²

Competitive suppliers that failed to submit reports as noted above, or that failed to re-submit corrected reports, are marked with an asterisk. GHG emissions were calculated for these retail sellers.

App 1 GHG Emissions Tables

2023 Massachusetts Retail Seller GHG Emissions (Short Tons CO₂e):

Table 5a. for Electric Utilities

Table 5b. for Competitive Suppliers

Table 5c. for Municipal Electric Departments

¹² Alternative Compliance Payments (ACPs) are not considered as part of Retail Seller GHG Reporting, and certificates previously banked with DOER are accounted for in the year they were generated. Therefore, these result in no MWh being subtracted and no emissions being added to a retail seller’s GHG emissions report in Step 4.

Appendix 2A: Optional Unit-Specific Generation Reported by MEDs for 2023

Below is a summary of the 2023 data that MEDs chose to submit from unit-specific generation. Most unit-specific generation submitted by MEDs in 2023 was non-emitting. Figures 7 and 8 present the unit-specific MWh reported by each MED and the ratio of their unit-specific MWh to their retail sales. MEDs are presented in order of increasing percentage of unit-specific generation reported. Figure 7 compares the unit-specific MWh reported as a percentage of total retail sales. Figure 8 indicates the variation in total MWh sales.

The individual MED values presented in Figures 7 and 8 are listed in alphabetical order of MED in Tables 6 and 7 on the “App 2A MED Unit-Specific” tab of the accompanying RS Summary Appendices spreadsheet.

App 2A MED Unit Specific Tables

Table 6. Individual 2023 MED Percent of Sales Claimed as Unit-Specific Generation

Table 7. Individual 2023 MED GHG Emission Factors (lb CO₂e/MWh)

Figure 7. Unit-specific MWh Reported by MEDs (MWh and Percent of Total Retail Sales)

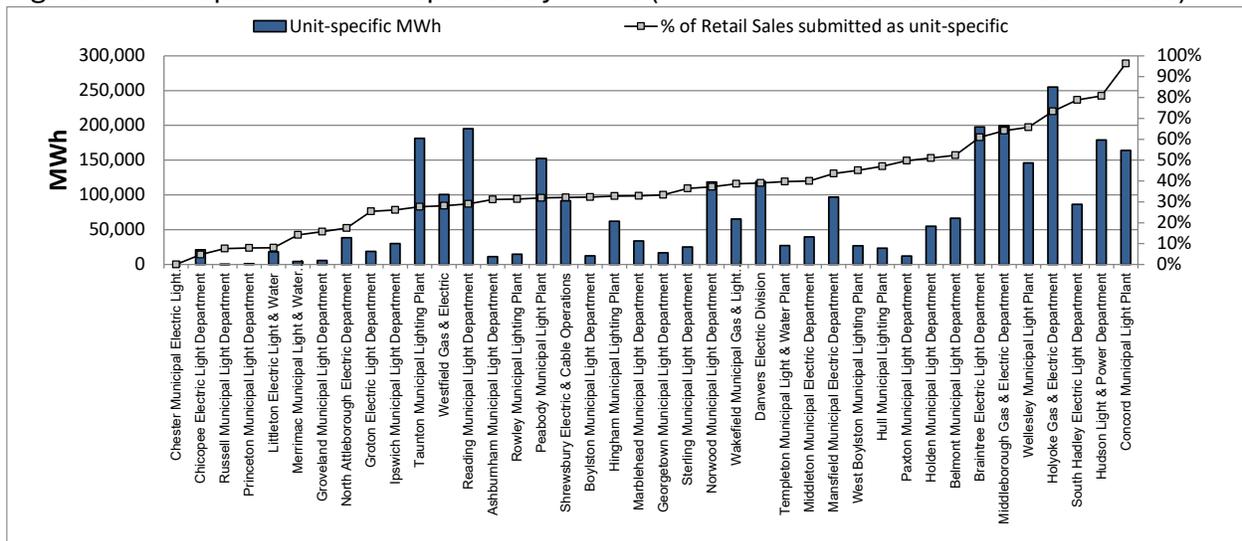
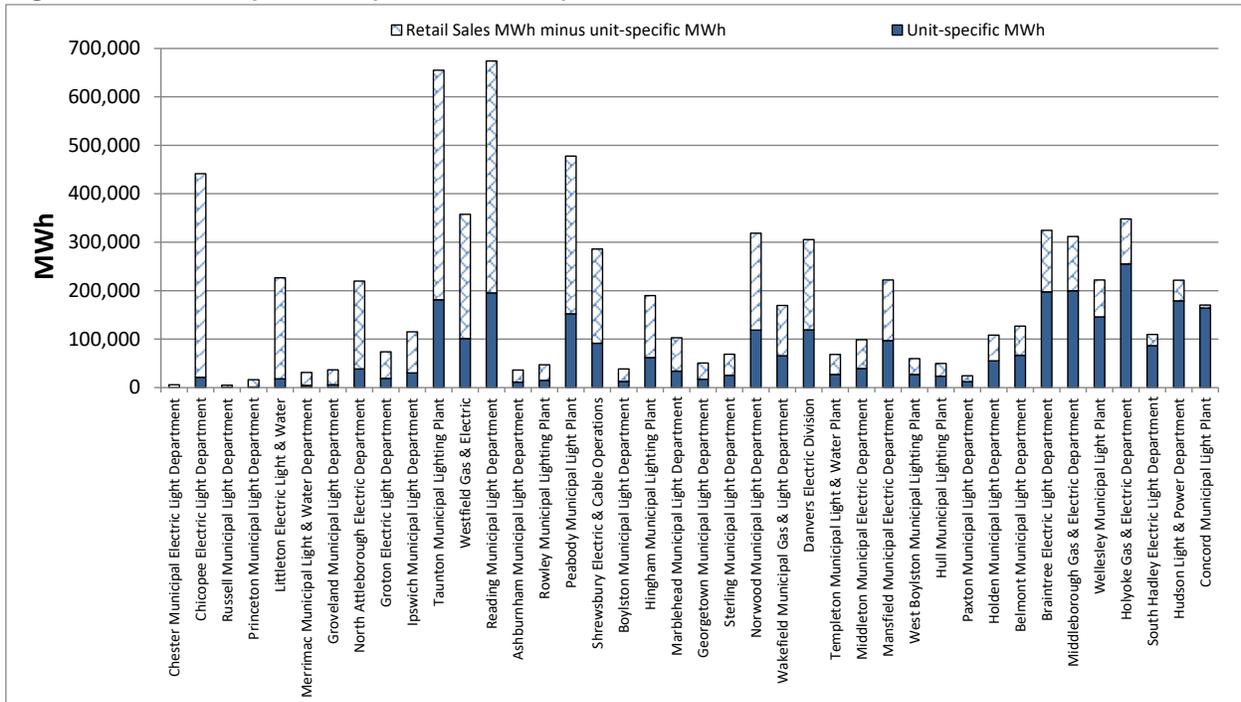


Figure 8. Electricity Sales by MED: Unit-Specific MWh vs. Total Retail Sales MWh



Figures 9 and 10 provide the MWh reported by MEDs from unit-specific generation by fuel and reporting type and by location and reporting type. Figures 11, 12 and 13 provide the unit-specific generation reported by MEDs as a percent by fuel, by location and by reporting type. The tables below each figure list the corresponding values. Information on GHG emissions of each MED can be found in Appendix 1: *2023 Individual Retail Seller GHG Emissions*.

Figure 9. MWh reported by MEDs from unit-specific generation by Fuel and Reporting Type

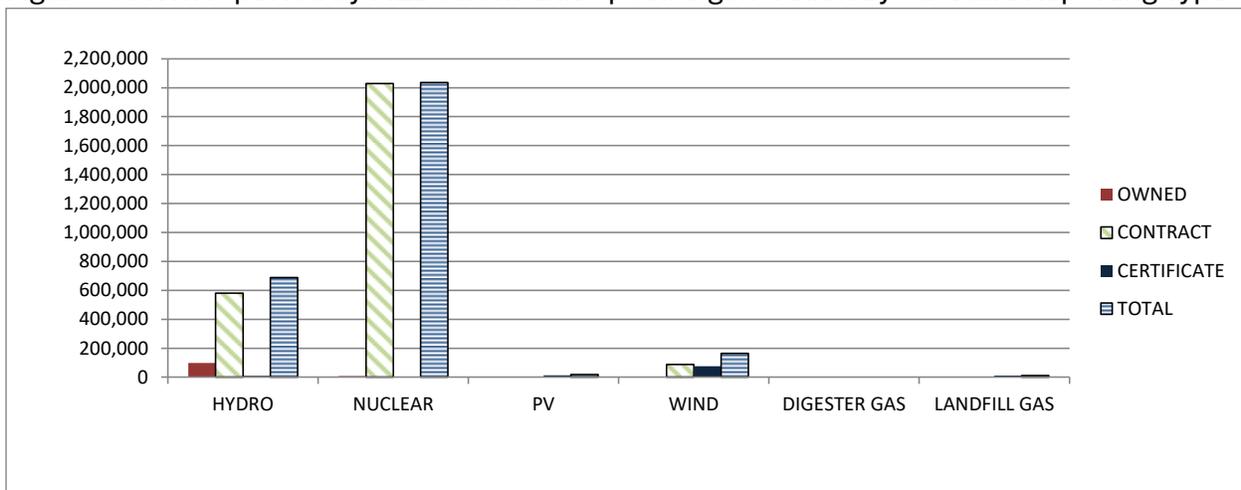


Figure 9 Table. MWh reported by MEDs from unit-specific generation by Fuel and Reporting Type

Reporting Type	Hydro	Nuclear	Solar (PV)	Wind	Digester Gas	Landfill Gas
Owned	98,143	7,377	3,963	0	0	0
Contract	579,822	2,028,244	0	88,450	0	0
Certificate	9,698	0	13,280	75,506	0	10,631
Total	687,663	2,035,621	17,243	163,956	0	10,631

Figure 10. MWh reported by MEDs from unit-specific generation by Location and Reporting Type

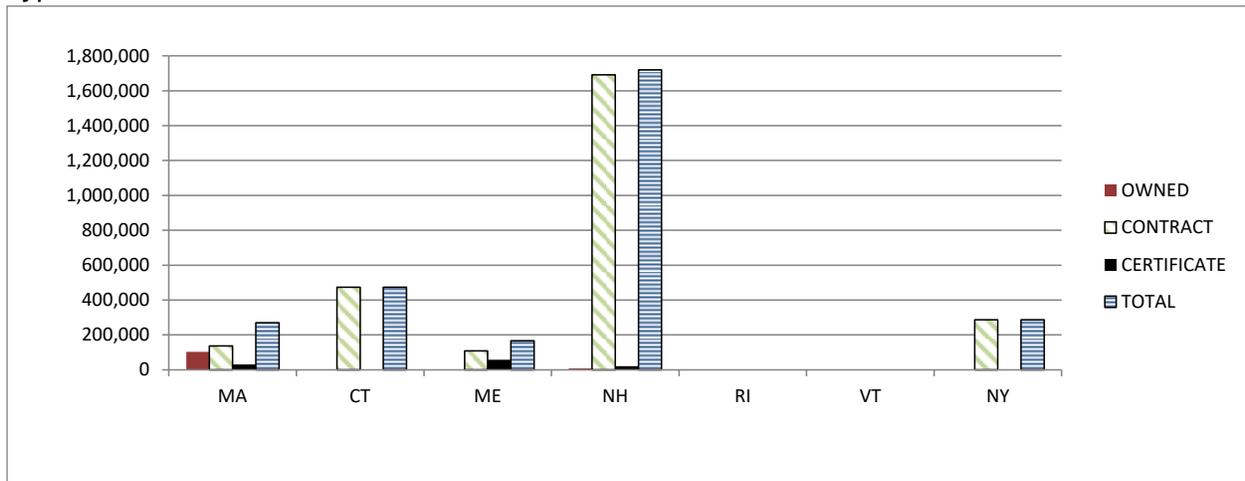


Figure 10 Table. MWh reported by MEDs from unit-specific generation by Location and Reporting Type

Reporting Type	MA	CT	ME	NH	RI	VT	NY
Owned	102,106	0	0	7,377	0	0	0
Contract	136,881	473,383	108,571	1,691,503	0	0	286,078
Certificate	30,590	0	57,932	20,593	0	0	0
Total	269,577	473,383	166,503	1,719,573	0	0	286,978

Figure 11. MWh reported by MEDs from unit-specific generation as Percent by Fuel Type

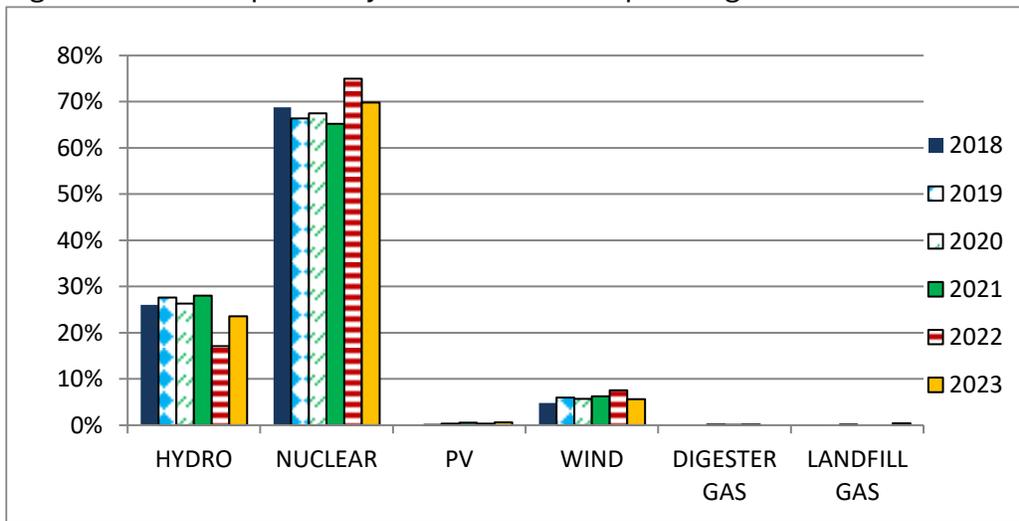


Figure 11 Table. MWh reported by MEDs from unit-specific generation as Percent by Fuel Type

Year	Hydro	Nuclear	Solar (PV)	Wind	Digester Gas	Landfill Gas
2018	26.0%	68.8%	0.2%	4.8%	0%	0.2%
2019	27.6%	66.4%	0%	6.0%	0%	0%
2020	26.3%	67.5%	0.3%	5.7%	0.1%	0.1%
2021	28.0%	65.2%	0.5%	6.2%	0%	0%
2022	17.1%	75.0%	0.3%	7.5%	0.1%	0%
2023	23.6%	69.8%	0.6%	5.6%	0%	0.4%

Figure 12. MWh reported by MEDs from unit-specific generation as Percent by Location

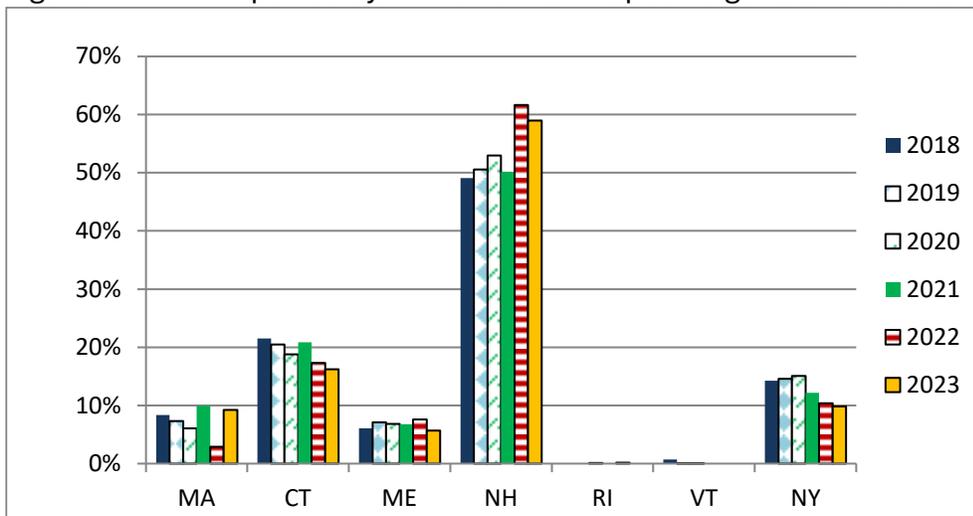


Figure 12 Table. MWh reported by MEDs from unit-specific generation as Percent by Location

Year	MA	CT	ME	NH	RI	VT	NY
2018	8.4%	21.5%	6.1%	49.1%	0%	0.7%	14.3%
2019	7.3%	20.5%	7.1%	50.5%	0%	0%	14.6%
2020	6.1%	18.8%	6.8%	53.0%	0.1%	0%	15.1%
2021	9.9%	20.9%	6.8%	50.1%	0.1%	0%	12.2%
2022	2.9%	17.3%	7.6%	61.6%	0.2%	0%	10.4%
2023	9.2%	16.2%	5.7%	59.0%	0%	0%	9.8%

Figure 13. MWh reported by MEDs from unit-specific generation as Percent by Reporting Type

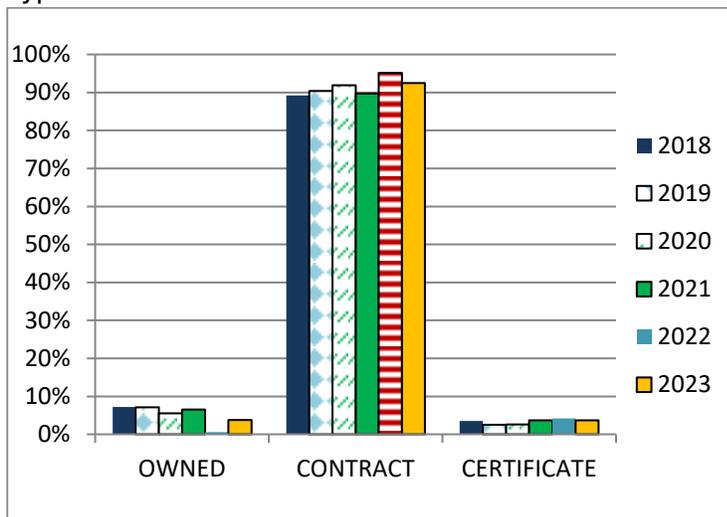


Figure 13 Table. MWh reported by MEDs from unit-specific generation as Percent by Reporting Type

Year	Owned	Contract	Certificate
2018	7.2%	89.2%	3.5%
2019	7.1%	90.4%	2.5%
2020	5.5%	91.9%	2.6%
2021	6.5%	89.8%	3.7%
2022	0.6%	95.2%	4.2%
2023	3.8%	92.5%	3.7%

Appendix 2B: Unit-Specific Generation from GIS Certificates Reported by Electric Utilities and Competitive Suppliers for 2023

Summaries of the 2023 data reported by each electric utility and competitive supplier from unit-specific generation are provided on the Electric Utilities and Competitive Suppliers (EU-CS) “App 2B EU-CS Unit-Specific” tab of the RS Summary Appendices spreadsheet. Because the certificates, by state and fuel type, purchased by electric utilities and competitive suppliers for compliance¹³ with various programs are already included in the RPS/APS/CES Annual Compliance Reports,¹⁴ that information is not repeated in this summary report.

Table 8 lists the individual 2023 electric utility and competitive supplier percent of sales claimed as unit-specific generation. Table 9 lists the individual electric utility and competitive supplier lb CO₂e/MWh emission rates (GHG emissions divided by retail load). The emission factors for individual electric utilities and competitive suppliers in Table 9 should not be compared to the individual emission factors calculated for MEDs in Table 7 of Appendix 2A: *Optional Unit-Specific Generation Reported by MEDs for 2023*, because the requirement to retire MSW certificates¹⁵ causes electric utilities and competitive suppliers to have higher emission factors than MEDs.

The use of banked certificates or alternative compliance payments¹⁶ by electric utilities and competitive suppliers to meet their compliance requirements with these programs is not reflected in these summaries. “N/A” appears in the unit-specific generation columns for competitive suppliers that did not submit any unit-specific information. Competitive suppliers that failed to submit, or to correct, a unit specific or GHG emissions report are marked with an asterisk. The percent of sales claimed as unit-specific generation and individual emission factors were calculated for those retail sellers, where possible.

App 2B EU-CS Unit-Specific Tables

Individual 2023 Percent of Sales Claimed as Unit-Specific Generation

Table 8a. for Electric Utilities

Table 8b. for Competitive Suppliers

Individual 2023 Emission Factors (lb CO₂e/MWh)

Table 9a. for Electric Utilities

Table 9b. for Competitive Suppliers

¹³ Retired certificates from units that produce thermal energy are not reported for the purpose of calculating GHG emissions from electricity.

¹⁴ These reports can be found at [Annual Compliance Reports and Other Publications](#).

¹⁵ See footnote 10.

¹⁶ See footnote 12.

Appendix 3: 2023 Retail Level Emission Factors for Use by Consumers of Electricity to Report Greenhouse Gas Emissions (Massachusetts-based Emission Factors)

Some electricity consumers have expressed interest in using Massachusetts-specific greenhouse gas (GHG) emission factors (EFs) to report their GHG emissions from use of electricity. The EFs shown earlier in this document are often not appropriate for use by electricity consumers for two reasons: first, the EFs earlier in this document are for the combination of CO₂, CH₄ and N₂O when many electricity consumers seek EFs for the individual gases and, second, the EFs earlier in this document are per wholesale MWh, rather than per retail meter MWh (or kWh) that electricity consumers see on their electric bill. In order to assist electricity consumers in reporting GHGs, this appendix presents the 2023 EFs that consumers of electricity would use to report their GHG emissions at a retail electricity level.

Combined, Biogenic and Non-Biogenic EFs: Progress on achieving the GHG reduction limits in the Global Warming Solutions Act is determined using Massachusetts-based emission calculations. Thus, it is Massachusetts-based EFs that consumers of electricity should use to determine GHG emissions. The Massachusetts-based non-biogenic EFs include all CO₂, CH₄ and N₂O emissions from non-biogenic (fossil) and CH₄ and N₂O emissions from biogenic (non-fossil) fuels combusted to generate the electricity sold by retail sellers of electricity in Massachusetts. The Massachusetts-based biogenic EFs include only the CO₂ from biogenic fuel combustion. The Combined EF adds the Non-Biogenic and Biogenic EFs together.

2023 RS Wholesale Non-Biogenic MA-based EF + 2023 RS Wholesale Biogenic MA-based EF = 2023 RS Wholesale Combined MA-based EF

Specifically for 2023: 431 lb of Non-Biogenic CO₂e/Wholesale MWh + 62 lb of Biogenic CO₂e/Wholesale MWh = 493 lb of Combined CO₂e/Wholesale MWh

Wholesale v. Retail EFs (line losses): Power lines lose 6%¹⁷ (on average) of the electricity they carry. The amount of wholesale MWh needed to deliver a particular amount of electricity at the retail level is, therefore, 6% greater than the amount shown on a retail meter. The emissions released to produce the electricity can be spread out over either the larger number of wholesale MWh or the smaller number of retail MWh, such that the retail lb/MWh EF will always be higher than the wholesale lb/MWh EF:

Wholesale Combined EF / (100% of MWh – 6% of MWh due to line losses) = Retail Combined EF

¹⁷ This value was updated to align with the line loss value used in the Interim Massachusetts Clean Energy and Climate Plan for 2030, dated December 2020.

Specifically for 2023: 493 lb CO₂e/Wholesale MWh / (1 - 0.06) = 524 lb CO₂e/Retail MWh.

Table 11. 2023 Massachusetts-based CO₂e GHG Emission Factors

Emission Factor Type	Retail Seller Wholesale Level (lb CO ₂ e/Wholesale MWh)	Electricity Consumer Retail Level (lb CO ₂ e/Retail MWh)
Non-Biogenic	431	459
Biogenic	62	66
Combined	493	524

Individual CO₂, CH₄, and N₂O EFs: If a consumer wants to use EFs by individual gas, then the lb CO₂e/MWh value needs to be separated into the individual components: lb CO₂/MWh, lb CH₄/MWh, and lb N₂O/MWh. MassDEP has separated the three gases by alternately zeroing out the other two gases on the ‘Calculating CO₂e’ and the ‘GIS CO₂e’ tabs of the retail seller EF spreadsheet at [MassDEP Emission Factor Calculations](#). For the 2023 retail level Combined EF, this results in 522 lb of CO₂e from CO₂, 1 lb of CO₂e from CH₄, and 2 lb of CO₂e from N₂O. The global warming potential (GWP) of each gas must then be taken into account to determine the EF for each gas. The GWPs used through 2023 by MassDEP are: 1 for CO₂, 25 for CH₄, and 298 for N₂O.¹⁸

$$\text{lb of CO}_2\text{e/MWh} = ((\text{lb of CO}_2 * 1) + (\text{lb of CH}_4 * 25) + (\text{lb of N}_2\text{O} * 298)) / \text{MWh}.$$

Specifically for 2023: 1.1 lb of CO₂e from CH₄ / 25 = 0.045 lb of CH₄ and 1.7 lb of CO₂e from N₂O / 298 = 0.006 lb of N₂O; therefore, 524 lb of CO₂e/Retail MWh = (522 lb of CO₂ + (0.045 lb of CH₄ * 25) + (0.006 lb of N₂O * 298))/Retail MWh.

The breakdown of the 524 lb CO₂e/Retail MWh value from Table 11 into individual gases, at various scales of electricity, is shown in Table 12.

Table 12. 2023 Electricity Consumers Retail-level Massachusetts-based GHG Emission Factors by Individual Gas

Units	CO ₂	CH ₄	N ₂ O
lb/Retail kWh	0.522	0.000045	0.000006
lb/Retail MWh	522	0.045	0.006
lb/Retail GWh	522,000	45	6

The lb/Retail kWh values in the upper row of Table 12 may be the values most likely to be used by electricity consumers since most electric bills show kWh use.

¹⁸ Beginning with the 2014 EFs, MassDEP updated the global warming potentials (GWPs) it uses based on the Intergovernmental Panel on Climate Change’s (IPCC’s) Fourth Assessment Report (AR4), published in 2007, similar to most other reporting programs. The global GWPs used with earlier EFs were from IPCC’s Second Assessment Report (SAR) published in 1996.

The breakdown of the 522 lb CO₂/Retail MWh value from Table 12 into its non-biogenic and biogenic components is shown in Table 13. All CH₄ and N₂O emissions are considered non-biogenic and thus cannot be further broken down.

Table 13. 2023 Electricity Consumers Retail-level Massachusetts-based Non-Biogenic and Biogenic CO₂ Emission Factors

Units	Non-Biogenic CO₂	Biogenic CO₂
lb/Retail kWh	0.456	0.066
lb/Retail MWh	456	66
lb/Retail GWh	456,000	66,000